# PROVISIONAL INTELLIGENCE REPORT

# THE CEMENT INDUSTRY OF COMMUNIST CHINA


CIA/RR PR-140
27 April 1956

## CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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S-E-C-R-E-T

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CIA/RR PR-140

(ORR Project 47.993)

NOTICE

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## FOREWORD

The purpose of this report is to clarify some aspects of the growth of the cement industry of Communist China over the years 1949-59.

The production of cement is an important index of construction activity. A status report on the industry provides, therefore, one of the steps to an understanding of the status of construction activity in the economy of Communist China.

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# THE CEMENT INDUSTRY OF COMMUNIST CHINA*

## Summary

The cement industry of Communist China can be expected to produce 6.4 million metric tons** of cement in 1957, exceeding the planned goal of 6.0 million tons. In addition, the increase in production capacity planned by the industry under the Five Year Plan (1953-57), an increase of 2.36 million tons over 1952 production capacity, probably will be attained before the end of 1957.

Most of the additions to production capacity for the years 1949-54 were obtained by investment in the rehabilitation and reconstruction of facilities which were well developed and modernized by the beginning of World War II. The pattern for the years 1955-57, however, is one in which the construction of new plants predominates, thus requiring greater expenditures of time and investment funds per ton of increase in production capacity.

The relative ease with which production capacity was expanded by rehabilitation of the industry in the years 1949-52 and the rapid improvement in the rate of utilization of capacity in 1953 and 1954 were primarily responsible for the rapid increase in the production of cement from 0.66 million tons in 1949 to 4.6 million tons in 1954.

A further increase in the rate of utilization of capacity, from an estimated 84 percent in 1954 to a probable 89 percent for the years 1955-57, will play an important part in the overfulfillment of the 1957 production goal. The major increase in these last 3 years of the Five Year Plan, however, must come from the investment program for increasing production capacity, with emphasis on the construction of new cement plants.

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 1 January 1956.
** Tonnages are given in metric tons throughout this report.



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The industry's investment program for 1955-57 is considerably more important to its growth than was its program for 1953-54. Whereas only 21 percent of the increase in annual production for 1954 over 1952 depended upon an increase in annual production capacity, 84 percent of the estimated increase in annual production for 1957 over 1954 will depend on such an increase. This fact, combined with the fact that the expansion in production capacity scheduled for 1955-57 will be achieved largely through the construction of new cement plants, indicates that the cement industry will continue to play an important part in the industrialization of Communist China. The Chinese, however, will have to devote a proportionally greater amount of the investment resources of the country to the cement industry than has been necessary in the past.

An estimated capital investment of 242 million yuan* is required to complete the 1955-57 investment program for increasing the production capacity of the industry by 1.71 million tons.

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## I. Production, Capacity, and Operating Rates, 1949-57.

The cement industry of Communist China is the product of expanded production and production capacity which was attained largely as a result of development in the cement industry before the Communist regime came into power. By the beginning of World War II the cement industry had become one of the most modernized industries in all of China, and the momentum gained thereby contributed greatly to the survival of the industry through World War II and to its rapid revival after the war.

### A. Production, 1949-57.

After the consolidation of Chinese Communist military and political power, production of cement rose rapidly from a low of approximately 660,000 tons in 1949 to 2.9 million tons in 1952

* Equivalent to US $26 million, at the exchange rate of 1 yuan = 0.516 rupee; 1 rupee = US $0.21.

and 4.6 million tons in 1954 (see Table 1*). Preliminary reports on the production of cement for the year 1955 have not yet been received, but it is estimated that a production of 5.3 million tons** is feasible.

Because the Five Year Plan (1953-57) goal of an annual production in 1957 of 6.0 million tons probably will be overfulfilled by about 0.4 million tons, the cement industry will have increased production almost tenfold in 8 years.

B. Capacity and Operating Rates, 1949-57.

In addition to the 1957 production goal of 6.0 million tons of cement, the Five Year Plan for Communist China stipulates that annual production capacity is to increase by 2.36 million tons over the 5 years. 2/ Since this production goal implies a 5-year increase in annual production of 3.14 million tons, whereas annual production capacity is to increase by only 2.36 million tons, achievement of the goal will depend upon an industry-wide increase in the operating rate (actual production as a percentage of production capacity) in addition to the projected increase in annual production capacity.

In 1953 and 1954, the first 2 years of the Five Year Plan, only 0.65 million tons were added to annual production capacity, whereas annual production was increased by 1.74 million tons, or almost three times as much. Fifty-four percent of the planned 5-year increase in the annual production*** of cement was fulfilled by the end of 1954, whereas only 28 percent of the planned increase in annual production capacity was achieved. Thus the increases in production in 1953 and 1954 were dependent upon a considerable increase in the operating rate. (See Figure 1.****)

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* Table 1 follows on p. 4.

** This is an increase of 15 percent over 1954 production. A planned increase of 23 percent was first announced. Later, it apparently was reduced to 21.7 percent. Although production for the first half of 1955 was said to have increased more than 20 percent over that for the first half of 1954, cement was not among those products which were listed as having fulfilled 50 percent or more of their respective planned annual production goals for 1955. Furthermore, cement was not among those products for which annual production was overfulfilled or almost fulfilled by the end of November 1955. 1/ (For serially numbered source references, see Appendix E.)

*** All references to production and production capacity are in annual terms, except where noted otherwise.

**** Following p. 4.

Table 1

Production, Capacity, and Operating Rates in the Cement Industry of Communist China 1949-57

| Year | (1) Production (Million Metric Tons) | (2) Production Capacity a/ (Million Metric Tons) | (3) Operating Rate b/ (Percent) |
|---|---|---|---|
| 1949 | 0.66 c/ | N.A. | N.A. |
| 1950 | 1.4 d/ | N.A. | N.A. |
| 1951 | 2.5 d/ | N.A. | N.A. |
| 1952 | 2.86 e/ | 4.83 f/ | 59.2 |
| 1953 | 3.9 g/ | 5.10 | 76.4 h/ |
| 1954 | 4.60 i/ | 5.48 | 83.93 j/ |
| 1955 (estimate) | 5.3 | 6.0 | 89.0 |
| 1956 (estimate) | 5.7 | 6.4 | 89.0 |
| 1957 (estimate) | 6.4 k/ | 7.19 l/ | 89.0 |

a. Computed as the capacity achieved by the end of the calendar year. The concept of production capacity and its application is discussed in Appendix C.

b. Defined as column (1) divided by column (2) times 100. The kiln-utilization rate and the operating rate are treated as equivalents in Chinese Communist discussions. 3/ The operating rate will vary according to whether annual capacity is figured on a year-end basis, as in this table, or on the basis of an effective capacity for the given year. (For further discussion, see Appendix C.)

c. Derived from Chou En-lai's statement that estimated output in 1954 (4.73 million tons) was 7.2 times that of 1949. 4/

d. 5/

e. 6/

f. Derived by subtracting from 5.48 million tons the 0.65 million tons announced as having been added to production capacity in 1953 and 1954. 7/

g. 8/

h. 9/

i. 10/

Figure 1

## COMMUNIST CHINA
# CEMENT PRODUCTION, PRODUCTION CAPACITY, AND OPERATING RATES, 1952-57

(Millions of metric tons)

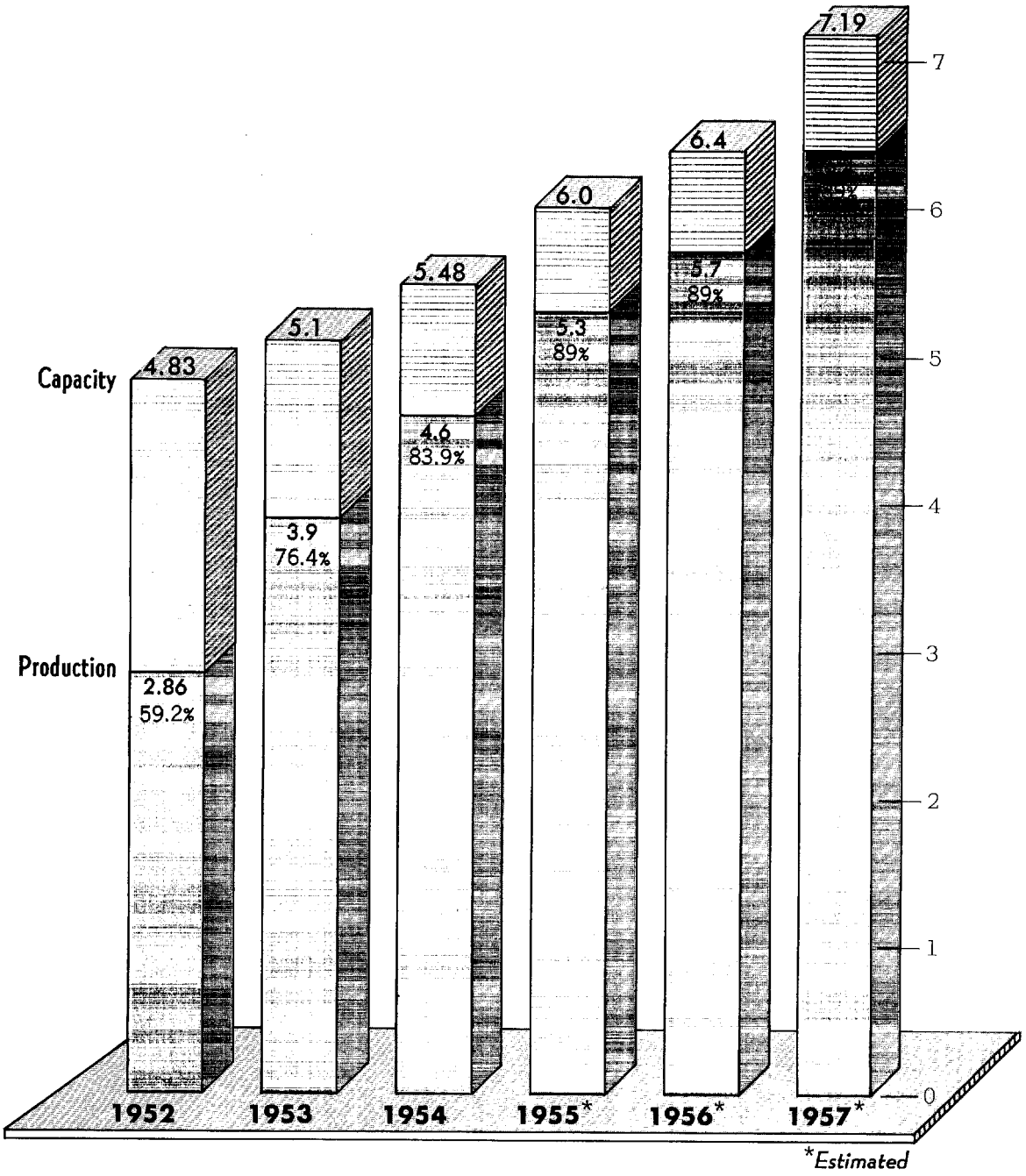


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Table 1

Production, Capacity, and Operating Rates in the Cement Industry of Communist China
1949-57
(Continued)

j. The kiln-utilization rate reported for the first half of 1954 11/ is assumed to apply for the entire year.
k. The Five Year Plan calls for 6.0 million tons. 12/
l. Derived by adding to the estimated production capacity for 1952 the planned increase of 2.36 million tons in production capacity under the Five Year Plan. This is effective capacity as well as year-end capacity.

Such an increase in the operating rate clearly depended upon the existence of unutilized capacity, and the increases in capacity achieved from 1949 through 1952 resulted primarily from rehabilitation* of capacity which existed in the pre-Communist era, especially in the Northeast Area.

By contrast, production in the last 3 years of the Five Year Plan must increase by only 1.4 million tons, whereas annual production capacity must be increased by 1.71 million tons to fulfill the respective goals of the Five Year Plan. If this increase in production capacity is achieved by the beginning of 1957, operation at the estimated 1954 operating rate of 84 percent would yield an increase in production equal to the 1.4-million-ton increase required to fulfill the 1957 goal.

In order to facilitate increases in production, the increased capacity must be available for use. The question of timing is therefore an important one. If it is assumed that the full increase of 1.71 million

* In this report, four types of additions to production capacity are distinguished, as follows: (1) rehabilitation -- the restoration of previously existing capacity; (2) reconstruction -- rehabilitation plus some additional expansion beyond previous capacity; (3) expansion -- additions to a given level of capacity not involving rehabilitation; and (4) new construction.

tons in production capacity is achieved in the period 1955-57 and if the operating rate is to remain at 84 percent, then the planned 1.71-million-ton increase in capacity must be achieved by the end of 1956 or thereabouts: that is, the planned production of 6.0 million tons in 1957 would require a usable annual production capacity of 7.19 million tons in early 1957 if the operating rate is to be only 84 percent.

The Chinese Communists, however, were not satisfied with the 1953 operating rate of 76.4 percent and may not be satisfied with the 84 percent attained in the first half of 1954. Since they claim that the standard operating rate of rotary kilns in the USSR is 89 percent and that several kilns in China were operating at 88 percent or more in 1953, 13/ they may be aiming at an operating rate as high as 89 percent.* If this rate were achieved for the years 1955-57, a total production capacity of only 6.74 million tons by the end of 1956 would permit China to reach a production of 6.0 million tons for 1957, and if the remaining 0.45 million tons of production capacity were added in 1957, the annual production capacity would be 7.19 million tons, and both the production and capacity goals of the Five Year Plan would be fulfilled.

The production goal for 1957 appears to be conservative in view of the estimated size and date of completion of the expansion program scheduled for the cement industry in the years 1955-57. The full increase of 1.71 million tons of production capacity required in the 1955-57 period apparently is accounted for by projects which were already under way in 1955.** If all of these projects are completed by the end of 1956, as appears quite probable, the cement industry of Communist China would be able to overfulfill the goal for the annual production of cement in 1957, since it is unlikely that the industry will continue to operate at only 84 percent of capacity.

## II. Expansion Program, 1953-60.

Over the period 1953-60 there are two important relationships between the increase in production and the expansion of the production capacity of the cement industry of Communist China.

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* The feasibility of such a rate is discussed in Appendix C.

** The expansion program is described in detail in III, below.

1. Annual production capacity apparently is to be increased by 3.6 million tons in the period 1953-59,* and over the 7 years this implies an average annual increase of 0.51 million tons. The 5-year increase (1953-57) of 2.36 million tons requires an average annual increase of 0.47 million tons. Since in the first 2 years of the Five Year Plan a total increase of only 0.65 million tons was achieved, 1.71 million tons must be added over the years 1955-57, or an annual average of 0.57 million tons. If the 1959 goal is to be achieved, 2.95 million tons must be added to annual production capacity, or an average annual increase of 0.59 million tons over the years 1955-59. Thus the average annual commitment to increase production capacity is growing over the period 1953-59.

2. The increasing importance of the expansion program is further illustrated by its relation to the increases in annual production from 1953 to 1957. Of the increase in production achieved for 1954 over 1952, only 21 percent is attributable to the investment program which increased production capacity.** Of the probable increase in production for 1957 over 1954, however, 84 percent is dependent upon the scheduled increase in production capacity.*** Thus the investment program is becoming increasingly important in the development of the Chinese Communist cement industry. This program is examined in detail in the following section.

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* Derived as follows: Ten above-norm cement plant projects, to be completed from 1953 to 1959, are to add 3.08 million tons to production capacity. 14/ ("Above-norm" and "below-norm" are references to the norm of investment for the cement industry -- 6 million yuan. Classification above or below the norm is a mechanism for facilitating management and control of the project.) Annual capacity is to increase by 3.6 million tons when all the projects, both above- and below-norm, which are started in the period of the Five Year Plan are completed. 15/ Below-norm projects probably will be completed in 2 years or less, so that any such projects started in 1957 should be completed by the end of 1959. It can be inferred, therefore, that the increase of 3.6 million tons in annual production capacity is to be achieved by the end of 1959.

** Based on the estimate that, in the aggregate, 70 percent of the announced increase in annual production capacity for 1954 over 1952 was operated at an average rate of 80 percent.

*** Based on the assumption that the scheduled expansion of production capacity for 1955-57 is effective for the year 1957 and operated at a rate of 89 percent.

## III. Investment Projects, 1952-57.

The extent of the investment program for the cement industry of Communist China is indicated by the fact that at least 90 percent of the cement plants are to be reconstructed or technically improved in the period of the Five Year Plan. 16/ The magnitude of the present tasks facing the cement industry is reflected in the pattern of major investment projects scheduled for the industry in the years 1955-57, a markedly different pattern from that of recent years.

### A. Expansion of the Industry, by Type of Project.

From 1949 to 1952, expansion of production capacity of the cement industry was obtained primarily by restoring previously existing capacity. In 1953 and 1954 the pattern was one of either expanding or reconstructing extant facilities. (See Table 2.*) Most of the increased production capacity scheduled to be available in the period 1955-57, however, will come from the construction of new plants. (See Table 3.**)

Four of the projects scheduled for completion in 1955-57 involve new construction, and two involve expansion or reconstruction of existing facilities.*** Of these two, the Kung-yuan plant reconstruction is so extensive that it is virtually new plant construction.****

The pattern of investment projects in the cement industry suggests that 1955 was the critical year of the Five Year Plan for this industry. The Harbin project was completed in April; the Nan-p'ing project was virtually completed in June; and the major projects at Ta-t'ung, Yung-teng, and Kung-yuan were to be well under way in 1955.*****

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* Table 2 follows on p. 9.

** Table 3 follows on p. 11.

*** Inconclusive data show that two other plants, reported to be at Hsiang-t'an and Pao-t'ou, may be under construction or expansion, 17/ but the character and extent of construction is not known.

**** The Pauley Report asserted that it was not practical to restore this plant, because of extensive removals of machinery and destruction of equipment and buildings. 18/

***** For the location of the most important plants of the cement industry of Communist China, see the map, Figure 2, inside back cover.

(Text continued on p. 12.)

Table 2

Construction Projects in the Cement Industry of Communist China
1952-54 a/

| Location | Project Type | Starting Date | Completion Date | Remarks |
|---|---|---|---|---|
| Chungkiang b/ | Reconstruction | N.A. | Early 1953 | Installed a kiln. |
| Ts'ao-t'an c/ | New plant (?) | N.A. | Expected June 1953 | Equipment from the USSR; possibly the same as the Sian plant. |
| Mu-tan-chiang d/ | Reconstruction | N.A. | September 1953 | Probably restored to annual production capacity of 150,000 tons or more. |
| Canton (San-chiao) e/ | Reconstruction | October 1952 | Expected 1953 | To be modernized. |
| T'ang-shan f/ | Reconstruction | N.A. | Estimated 1954 | Probably doubled its prewar capacity. |
| Liao-yang g/ | Reconstruction | 1953 | Expected 1953 | |
| Miao-ling h/ | Rehabilitation | 1953 | N.A. | |
| Lo-shan i/ | Expansion | 1954 | Expected 1954 | Production to double that of 1953. |
| T'ai-yuan j/ | Reconstruction | N.A. | July 1954 | Probably added 30,000 tons to annual production capacity. |
| Liu-li-ho k/ | Expansion | N.A. | November 1954 | Probably added 82,000 tons to annual production capacity. |
| K'un-ming l/ | Expansion | Early 1954 | End of 1954 | Output to be doubled. |
| Hang-chou m/ | Expansion | 1954 | Expected 1954 | Small plant -- to double its output. |
| Urumchi n/ (Sinkiang No. 1) | Expansion | Spring 1953 | April 1954 | Output to be trebled. |
| Ta-t'ung o/ | Reconstruction | April 1954 | December 1954 | Reconstruction of the original plant. |
| An-shan No. 1 p/ | Reconstruction | 1954 | Estimated 1954 | A slag cement plant. q/ |
| An-shan No. 2 r/ | New plant | Estimated June 1954 | Expected 1955 | Estimated annual production capacity of 100,000 to 150,000 tons of slag cement. q/ |

a. The arbitrary division of projects between Tables 2 and 3 is retained for the sake of cohesion in Table 3.
b. 19/
c. 20/
d. 21/
e. A "new" kiln reported in operation March 1953. 22/ Probably a reconstruction of the No. 3 kiln of the Canton plant.
f. 23/
g. 24/
h. 25/
i. 26/
j. 27/
k. 28/
l. 29/
m. 30/



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Table 2

Construction Projects in the Cement Industry of Communist China
1952-54
(Continued)

n. 31/
o. 32/ Not to be confused with the much larger plant now under construction at Ta-t'ung. (See Table 3, p. 11, below.)
p. 33/
q. A slag cement plant mixes ground cement clinker (obtained from kilns) with the ground slag residue from a steel plant, thereby producing a good quality of cement without running the materials through a kiln heating process. Such a plant can be built more easily than one requiring the use of a rotary kiln or kilns.
r. 34/




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Table 3

Construction Projects in the Cement Industry of Communist China and Completion Dates Scheduled for 1955-57 a/

| Location | Project Type | Estimated Starting Date | Estimated Completion Date | Estimated Additions to Annual Production Capacity (Million Metric Tons) |
|---|---|---|---|---|
| Harbin b/ | Expansion | April 1954 | May 1955 | 0.10 |
| Nan-p'ing c/ | New plant | June 1954 | June 1955 | 0.36 |
| Yung-teng d/ | New plant | 1954 | 1956 | 0.36 |
| Urumchi e/ (Sinkiang No. 2) | New plant | Mid-1955 | By end of 1956 | 0.36 |
| Ta-t'ung f/ | New plant | April 1955 | June to July 1956 | 0.36 |
| Kung-yuan g/ (Pen-ch'i No. 9) | Reconstruction | Early 1955 | June to July 1956 | 0.20 |
| Total | | | | 1.74 |

a. Smaller expansions of capacity undertaken in 1955 at the Szechwan and Canton cement plants (involving the installation of grinding equipment) 35/ are not included in Table 3.
b. 36/
c. 37/. Indirect evidence suggests the plant has a capacity of 360,000 tons per year.
d. The machinery and equipment going into this plant have a rated production capacity of 360,000 tons per year. 38/
e. 39/. The location of this plant is not known. The most probable location is in the Urumchi area. It is to be "ten times the size of Sinkiang No. 1 cement plant," or 360,000 tons per year.
f. The machinery and equipment going into this plant have a rated production capacity of 360,000 tons per year. 40/
g. 41/




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Reports on the rate of progress and expected completion of construction at Ta-t'ung are not uniform, but the project is a huge one and probably will not be in operation before the middle of 1956. The reconstruction at the Kung-yuan plant, scheduled to be 92 percent completed by the end of 1955, was behind schedule in April because most of the work planned for the first quarter of 1955 had not been initiated and work for the second quarter was yet to be decided upon.

The construction of a second cement plant in Sinkiang (probably in the Urumchi area) is interesting, especially in view of the estimated size of the plant. If the choice of location is an economic one, it should indicate the size of demand which is anticipated for the Urumchi area and Sinkiang in general. The starting date of construction is not known, but the allocation of capital investment for Sinkiang in 1955 apparently included funds for the construction of the plant. If construction was started in mid-1955 and no serious problems are encountered in the supply of machinery and equipment, the plant should be completed before the end of 1956.

The construction of the Yung-teng cement plant near Lan-chou gives to the Northwest Area 2 of the 4 large cement plants now under construction. With the completion of the Lan-chou - Sinkiang Railroad the Northwest Area will have at its terminals the Yuang-teng plant in the east and the two Sinkiang plants in the northwest. Thus the 1955-57 investment program of the cement industry has significant implications for the future of construction in the Northwest Area.

The investment program for 1955-57 is important, however, in its difference from the program for 1953-54 not only because of the greater increase in production capacity which it affords, but also because the increases in capacity planned for 1955-57 will be more costly than those in 1953-54 and earlier, in both time commitments and investment expenditures per ton of increased capacity.

Production capacity in the cement industry can be increased in a number of ways.* The respective capacities of different departments of given plants may differ, so that capacity may be increased by the simple expedient of expanding one department. The capacity of the grinding facilities, for example, may be so much greater than that of

* For a comparison of production of cement in Communist China, the US, and the USSR, see Appendix B.

the kiln department* that installation of preheating equipment (or another kiln) will increase the production capacity of the plant. An expansion of grinding facilities may permit fuller utilization of the kiln department. Both grinders and kilns may be added, or machinery and equipment may be remodeled. Finally, complete new plants may be constructed.

With reference to the different means by which production capacity was increased in 1953-54 as contrasted to 1955-57, the fact that the capacity of the industry is to be increased by the construction of new plants in 1955-57 should indicate, under rational planning, that the total investment costs per ton of capacity increase** are presently lower for new plant construction than they would be for further expansion and/or reconstruction schemes. Conversely, expansion and/or reconstruction schemes must have been the cheaper means of increasing production capacity in 1953-54. Therefore, the change in the pattern of additions to production capacity from 1953-54 to 1955-57 indicates that the relatively inexpensive means of increasing capacity employed in the past are not now available on a scale which will significantly contribute to the fulfillment of capacity goals.

B. Capital Investment in the Industry, 1955-57.

A clear statement on capital expenditure required in Communist China to construct cement plants of given production capacities is not yet available, although it has been stated recently in the Chinese Communist newspaper, Kung-jen Jih-pao, that 50 million yuan is a "sum sufficient to construct a large modern cement plant." 42/ It is estimated that 50 million yuan represents the planned capital expenditure for constructing a cement plant with an annual production capacity of 360,000 tons.***

* In practice, the capacity of grinding facilities should be somewhat greater than that of the kiln or kilns.

** Economy-wide costs, including transportation costs for distributing the product.

*** This estimate is based upon the following considerations:

1. The quoted statement must have some relevance to the size of cement plants actually being constructed in Communist China. (Planning costs have been announced by the Chinese Communists quoting costs for building textile mills, iron and steel combines, tractor plants, and motor vehicle plants of given capacities, and plants of those capacities have been or are being constructed.)

On the strength of this estimate and of the estimates for the Harbin and Kung-yuan projects, the 1955-57 projects (accounting for the planned increase in production capacity of 1.71 million tons during 1955-57) will require a capital investment of about 242 million yuan.*

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2. Fairly reliable evidence (see the footnotes to Table 3, p. 11, above) indicates that all 4 new cement plants are of a capacity of 360,000 tons per year.

3. The value of the capital investment in the machinery and equipment imported for the plants at Yung-teng and Ta-t'ung (the value f.o.b. East Germany plus estimated transportation costs -- converted from rubles at a June 1955 rate of 0.5 yuan equals 1 ruble) constitutes 42 to 44 percent of the 50-million-yuan capital investment assumed to apply to these plants. This is consistent with the general relationship stated for the period of the Five Year Plan -- for industry, 40 percent of total capital construction investments are to be devoted to the purchase of machinery and equipment. 43/

* See Appendix A.

APPENDIX A

## ESTIMATED INVESTMENT EXPENDITURE ON CEMENT PLANTS IN COMMUNIST CHINA 1955-57

In order to estimate the total capital investment required for the planned 1.71-million-ton increase in production capacity of cement plants in Communist China for 1955-57, some estimate must be made of the required capital expenditure for the Kung-yuan and Harbin projects.

The structure of costs in the construction of cement plants of different sizes follows the economic proposition that it is more economical to build a large plant than a small one (when economy is defined as cost per ton of annual capacity). Although an estimate of the cost in Communist China of building a cement plant with a capacity of 360,000 tons per year can be made from a statement by the Chinese Communist press, some other means must be used to estimate the cost of building smaller plants. A study of the planned capital expenditure in the cement industry of India provides the best available means for making such an estimate.

An estimated capital investment of 73 rupees per ton of annual capacity is required for erecting a new cement plant in India with an annual capacity of 360,000 tons.* Comparing the respective costs of constructing, in Communist China and India, a cement plant with a capacity of 360,000 tons per year, the proportional relationship is as follows:

China: Yuan cost per ton $\frac{139}{}$ equals 1.90

India: Rupee cost per ton $\frac{}{73}$

* This report computes annual capacity from rated daily capacity expanded on the basis of 365 working days in the year. The cement industry in India computes annual capacity from rated daily capacity on the basis of only 330 working days in the year. The figure cited above represents an estimated capital investment of 80 rupees per ton of annual capacity for a new cement plant in India with an annual capacity of 330,000 tons, 44/ converted to express the cost per ton on the basis of 365 working days in the year.

The proportional relationship between the currencies of the two countries* is as follows:

$$\text{Yuan } \frac{1.000}{0.516} \text{ Rupees} \quad \text{equals} \quad 1.94$$

For the construction of cement plants with a capacity of 360,000 tons per year, therefore, the yuan is neither overvalued nor undervalued compared with the rupee. The further considerations, that the economies of Communist China and India are similar in structure and that both countries are dependent upon imports of cement plant machinery and equipment from the European area,** seem to warrant the use of the Indian cost variations in estimating the cost of the Harbin and Kung-yuan projects.

The range of cost variation by size of new plant in the cement industry of India is as follows:

| Approximate Annual Capacity of New Plant (Thousand Metric Tons) | Index of Cost per Ton of Annual |
|---|---|
| 360 | 100 |
| 218 | 125 |
| 109 | 150 |

With this cost index an estimate of the cost of the projects in the cement industry of Communist China for 1955-57 can be made, as follows:

* The February 1954 exchange rate of 0.516 rupees equals 1 yuan (new currency) is used as most appropriate for the costs and time period involved.

** The Indian tariff on imports of machinery and equipment does not significantly affect the capital cost of erecting cement plants. 45/

| Project | Project Cost per Ton (Yuan) | Total Cost of Project (Million Yuan) |
|---|---|---|
| Harbin (expansion, 100,000 tons) | 135* | 14 |
| Nan-p'ing (new, 360,000 tons) | 139 | 50 |
| Yung-teng (new, 360,000 tons) | 139 | 50 |
| Ta-t'ung (new, 360,000 tons) | 139 | 50 |
| Sinkiang No. 2 (new, 360,000 tons) | 139 | 50 |
| Kung-yuan (reconstruction, 200,000 tons) | 139** | 28 |
| Total | | 242 |

* Based on the cost index (150) for a new cement plant with a capacity of 109,000 tons per year, less 35 percent for the fact that Harbin is an expansion project. The Indian study uses a 20-percent reduction for expansion projects, but half of the Indian expansion projects are more than doubling their original capacities. 46/ A reduction of 35 percent is used, therefore, for the more favorable conditions under which the Harbin project is being expanded.

** Based on the cost index (125) for a 218,000-ton plant, reduced by 20 percent to account for the usable facilities remaining from the old Kung-yuan plant.

APPENDIX B

COMPARISON OF CEMENT PRODUCTION IN COMMUNIST CHINA, THE USSR, AND THE US
1949-55

Table 4 a/

Million Metric Tons

| Year | Communist China | USSR b/ | US c/ |
|---|---|---|---|
| 1949 | 0.66 | 8.1 | 35.5 |
| 1950 | 1.4 | 10.2 | 38.1 |
| 1951 | 2.5 | 12.1 | 41.3 |
| 1952 | 2.86 | 13.9 | 41.9 |
| 1953 | 3.9 | 16.0 | 44.5 |
| 1954 | 4.60 | 19.0 | 45.8 |
| 1955 | 5.3 | 22.4 | 50.4 d/ |

a. Production data for the US are for Portland cement. The proportions of Portland cement in the production data for the USSR and Communist China are not available.
b. 47/. Data for 1950-54 are computed from monthly averages supplied by the Central Statistical Administration of the USSR.
c. 48/. Excluding Puerto Rico. Converted on the basis of 5.85 barrels to the metric ton.
d. Unpublished Bureau of Mines estimate based on production for the first 10 months of 1955.

APPENDIX C

METHODOLOGY

1. Production Capacity.

In discussing production capacity, three concepts are to be distinguished, especially for international comparisons. Installed production capacity is the rated daily capacity of the machinery and equipment when newly installed, operating 24 hours daily, 365 days of the year. Actual production capacity is the installed production capacity discounted by some specified number of days to permit normal repairs for maintenance of the daily rated capacity. Actual production is the tonnage produced, which will be above or below the actual production capacity as the rate at which materials are run through the kiln and repair plus breakdown periods vary.

The Chinese Communists have not revealed which concept of capacity they use, but the Soviet cement industry apparently uses installed capacity. 49/ It is assumed, therefore, that the installed capacity concept can be used for Communist China.

Replies to a questionnaire sent to US cement plants by the Bureau of Mines indicate that annual production capacity is computed practically on the basis of a 365-day year, so that US figures on production capacity approach closely a concept of installed production capacity. On the other hand, in the Indian cement industry, capacity is rated on the basis of 330 working days in the year. 50/

Because the definition of capacity affects the rate at which a plant can be said to operate -- that is, the rate of utilization of capacity -- it is also important in the determination of what a feasible operating rate may be for a given country.

2. Operating Rates.

a. The ease with which the cement industry of Communist China can attain an operating rate of 89 percent in 1957 will vary with the definition of production capacity.

The cement industry of India operated at about 96 percent of capacity in the 3 years 1952-54, 51/ whereas the US industry operated at 84 to 90 percent of capacity in 1950-54 and was operating at 97 percent of capacity in the 12 months ending July 1955. 52/ If the figures for India are adjusted to a 365-day base for capacity, the operating rate for the Indian cement industry becomes 86 to 87 percent.

An operating rate of 87 to 90 percent, on an installed production capacity basis, thus appears to be feasible for the cement industry. The question remains as to whether an 89-percent figure is intended and feasible for the cement industry of Communist China.

In 1953 the Chief of the Control Bureau of the Construction Materials Industry was apparently calling for cement plants in Communist China to match the performance of the industry in the USSR, where the standard operating rate of the rotary kiln was given as 89 percent. 53/ Thus it is assumed in this report that the Chinese Communists are aiming at an operating rate of 89 percent. It is believed that such an operating rate is attainable for 1955-57 on the basis of installed production capacity.

b. The rate of kiln utilization for the industry has been used in this report as the equivalent of the operating rate in order to derive the production capacity of the industry. Aside from the fact that the Chinese Communists appear to use it as such, this procedure is warranted because, in the past, the kiln departments have been the limiting factors in the production of cement. But with the production of more mixed cement as planned by the industry, the capacity of the grinding facilities may become so much greater than the capacity of the kilns that the rate of kiln utilization may not reflect accurately the operating rate of the industry. Unless some adjustment for this is then made, the use of a rate of kiln utilization to estimate the production capacity is unwarranted. Because the production of mixed cements in 1954 is estimated at less than 10 percent of total production, the distortion is not a significant one.

3. Effective Capacity and Year-End Production Capacity.

Annual production capacity can be expressed as the annual capacity available to the industry at the end of a calendar year (year-end capacity), but it is expressed more meaningfully as effective capacity: that is, 1 January capacity plus capacity added between 1 January and 31 December prorated for actual time available for production.

Capacity given as effective capacity, when compared to production, gives a truer picture of the operating rate for the industry, whereas the use of year-end capacity understates the rate at which capacity actually is utilized during the year. Year-end capacity has been used in this report, however, for the sake of simplicity.

APPENDIX D

GAPS IN INTELLIGENCE

1. Product Quality and Types.

One of the most serious gaps in intelligence on the cement industry of Communist China is the lack of comprehensive data on the quality and types of cement produced.

There is no doubt that the industry has produced and plans to increase the production of mixed cements. 54/ Mixed cements are cements of lower structural strength than ordinary Portland grades and are obtained by adding pulverized adulterants such as shale and slag as the cement clinker is being ground into the finished product.

Mixed cements are satisfactory for foundation work of various types and represent a considerable saving for the industry and the country if produced and used where appropriate. 55/

The problem of maintaining the quality of given types of cement appears to be a fairly serious one for the industry. Only three cement plants kept their product up to standard in the first half of 1954. Conversely, the production of cement of unnecessarily high quality is not an unimportant aspect of waste in the industry. 56/

Since production figures for the country are given simply for "cement," intelligence estimates cannot show a breakdown by types of cement, and nothing is known as to the amount of unusable cement which might be included in official figures.

2. Source of Supply of Cement Plant Machinery and Equipment.

Another serious gap in intelligence is the lack of specific information on how the industry secured the machinery and equipment necessary to the expansion of production capacity and how it is to be secured in the future.

The cement industry is still dependent upon imports in the construction of complete cement plants, but too little is known about the domestic supply of individual parts to cement plants.

3. Plant Production and Capacity.

Much more information is needed on the output of particular plants and the production capacity of each, especially of the smaller plants.

APPENDIX E

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

| Source of Information | Information |
|---|---|
| Doc. - Documentary | 1 - Confirmed by other sources |
| A - Completely reliable | 2 - Probably true |
| B - Usually reliable | 3 - Possibly true |
| C - Fairly reliable | 4 - Doubtful |
| D - Not usually reliable | 5 - Probably false |
| E - Not reliable | 6 - Cannot be judged |
| F - Cannot be judged | |

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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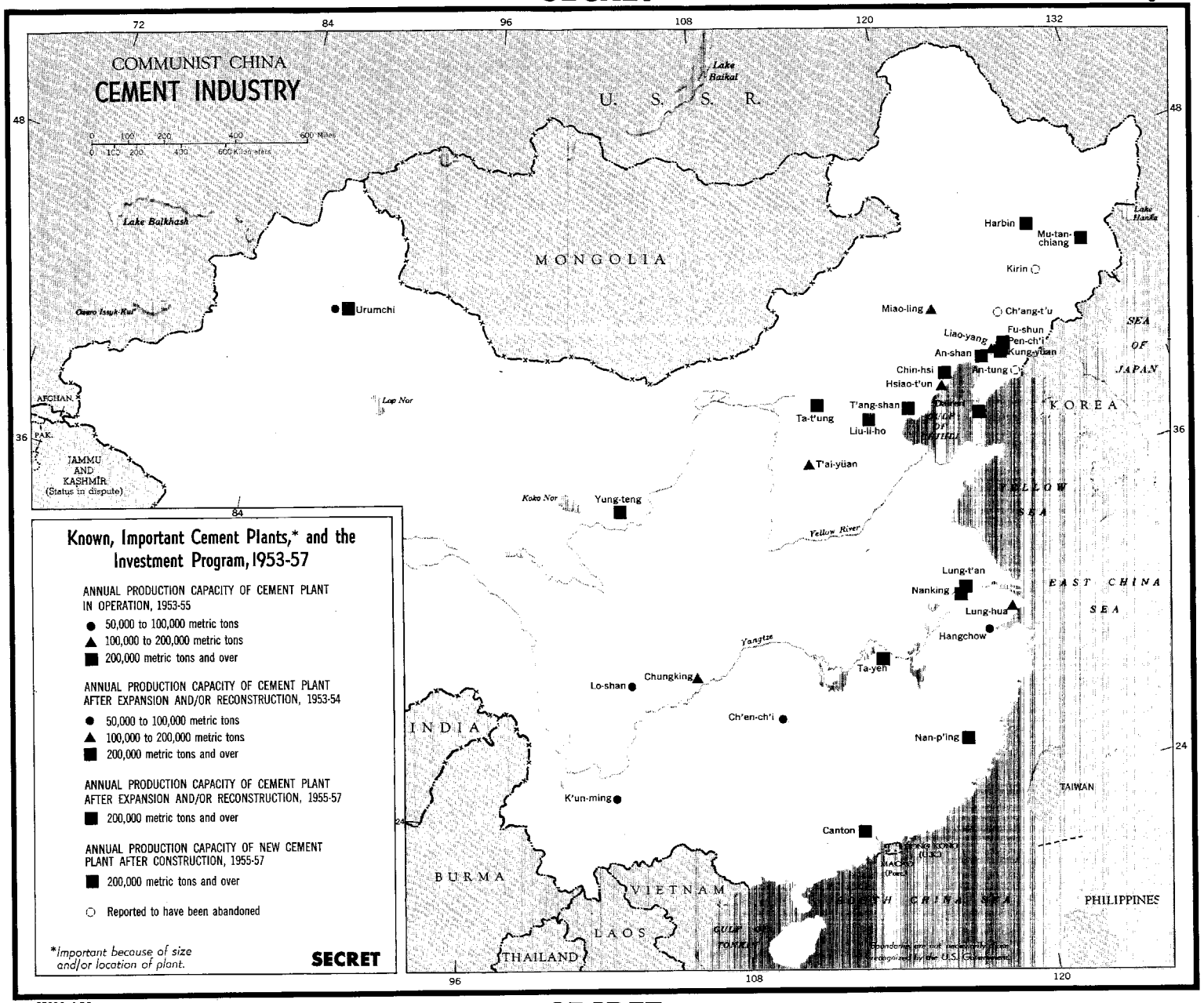
Figure 2

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